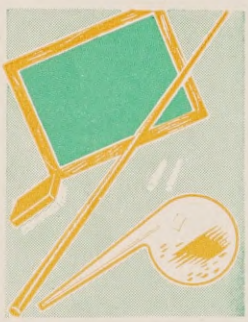
# Sound Conditioning—

## Quiet Comfort for School and College



Few people realize the complexity of the problems assigned to those who are charged with the responsibility of properly operating an educational unit or system.

Operation and maintenance of grounds and buildings, sanitation, safety, health, recreation facilities and planning, designation of proper textbooks . . . selection of instructors . . . the purchase of supplies ranging from the right blackboard crayon to elaborate laboratory equipment . . . heating and ventilating . . . office and clerical organization . . . proper lighting . . . environment surrounding schools . . . these are but a few of the many things to be handled . . . all are necessary to accomplish the effective education of students.

The members of school boards, public and private . . . boards of regents . . . college and university corporations . . . school administrators and faculty organizations . . . deserve high praise and undying gratitude for able administration and for the tireless efforts expended to keep today's educational institutions and methods abreast of the times.

Efficiency in teaching is the ultimate goal of these moulders of good citizenship.

☆ • ☆ • ☆ • ☆

***Because noise has been found to be one of the greatest obstacles to effective teaching . . . those responsible for education are eliminating this condition . . . quickly, easily . . . and at small cost . . . by sound conditioning with Acousti-Celotex.***

Only those who teach know the experience of well prepared lectures and outlines resulting in little or no effect on the students. Lack of interest is a discouraging reward for careful planning of subject matter.

Lack of thought on the part of students . . . their failure to concentrate . . . is often the fault of noise . . . not the fault of the student or the instructor.

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**Young minds are provided with every opportunity to learn in this quieted classroom in the East Bethesda Elementary School, Bethesda, Md., because architect A. Hamilton Wilson used Acousti-Celotex Sound Conditioning on the ceiling.**

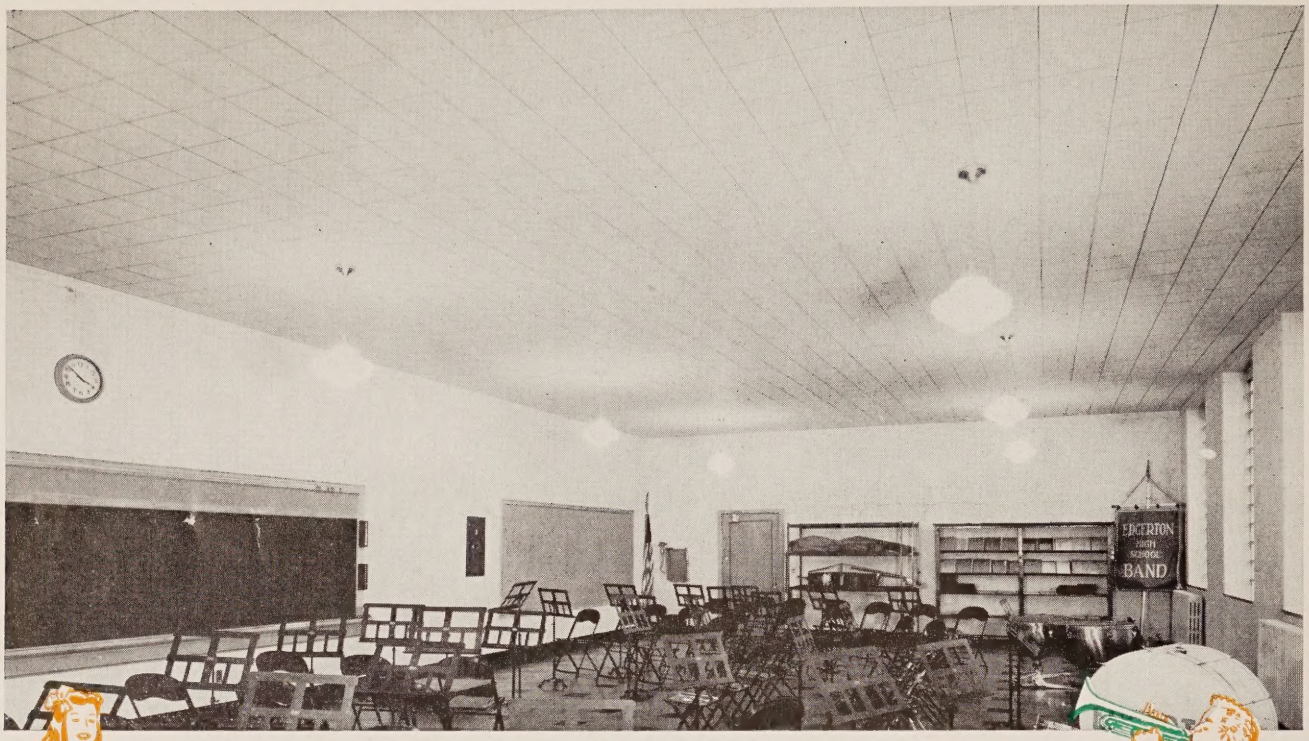
***Noise*** discourages thinking and interferes with concentration. Few students have the mental toughness required to think and concentrate in an atmosphere disturbed by the noises of a restless class . . . of student traffic in corridors . . . of band and choral practice rooms nearby . . . of street traffic noises filtering in through open windows, and the hum of activity throughout the building.

***Noise*** causes a fear reaction. This fact has long been accepted by the medical profession. Dr. Herman N. Bundesen, Health Editor of The Chicago Herald American has reported ". . . loud noise causes about the same reaction as a great fright . . . it may be followed by what we call shock . . . there is a general feeling of depression and a loss of vitality."

***Noise*** interferes with accurate hearing. Investigation shows that a surprising amount of classroom procedure is misunderstood or entirely lost to the average student in ordinary classrooms, due to reverberation of unwanted sounds.

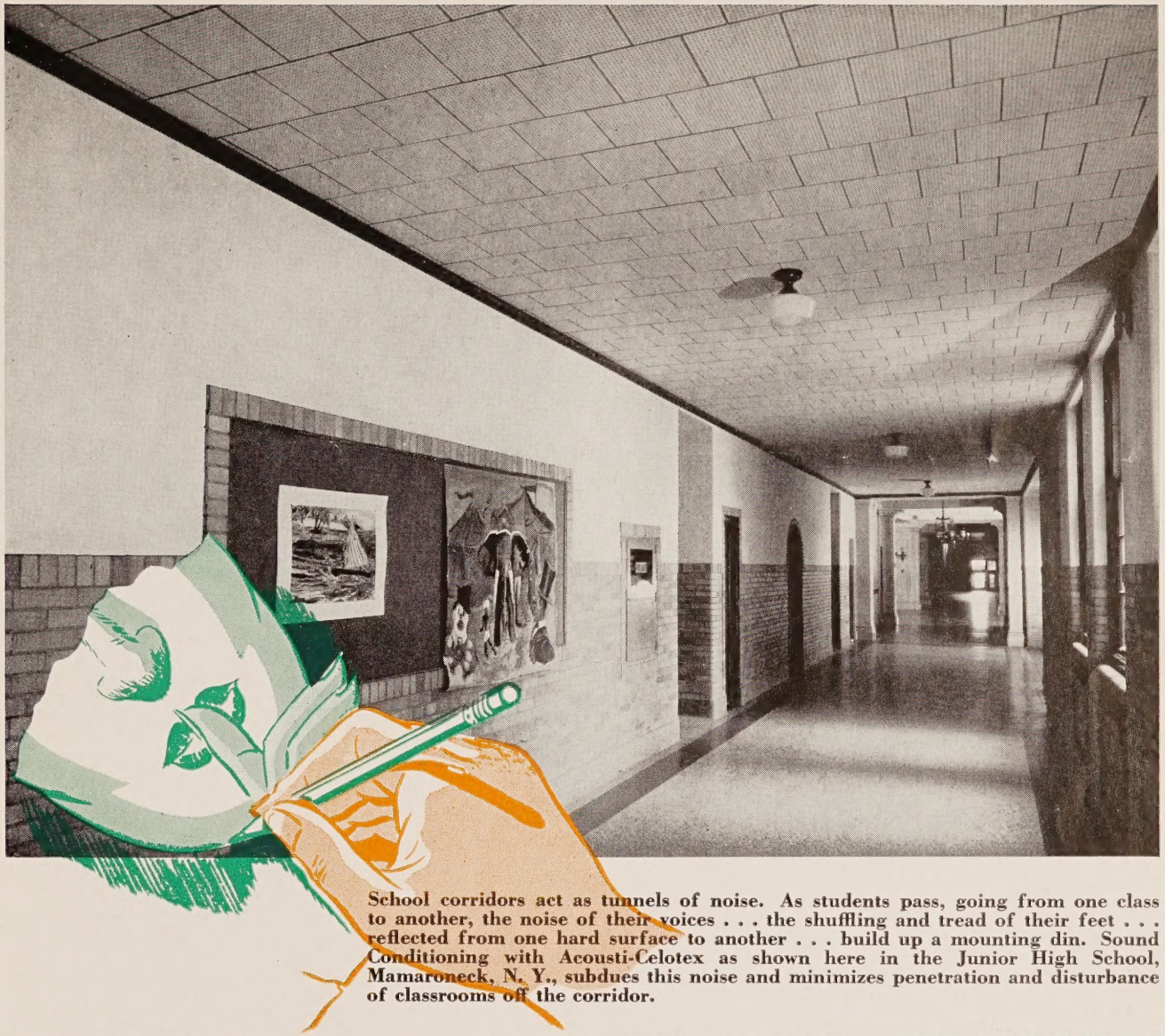
***Noise*** causes early fatigue and irritation. The din of echoing conversations . . . banging of doors and windows . . . the shuffling of feet . . . the inevitable traffic noise of students passing in corridors . . . all build up into a column of noise that causes mental strain on both instructor and student . . . that results in early fatigue.

***Excessive noise is one of the greatest handicaps to those who teach . . . yet it can be readily eliminated though the budget is limited.***




**Band directors experience great difficulty in attempting to develop smooth working, well disciplined bands and orchestras . . . when they are forced to work against the excessive reverberation of ordinary practice rooms. With Acousti-Celotex sound conditioning as shown in the Edgerton Public School, Edgerton, Wis., individual musicians, instruments, and sections are clearly distinguishable . . . and direction is simplified.**

**Cafeterias and lunch rooms are veritable "noise mills." Joyful but loud conversations of students . . . attempting to be heard above the crash and clatter of dishes, silverware . . . and foot traffic of passing patrons . . . produce an almost unbearable condition. Acousti-Celotex sound conditioning solved this irritating problem in the cafeteria of the University of North Carolina, Chapel Hill, N. C.**



**School corridors act as tunnels of noise. As students pass, going from one class to another, the noise of their voices . . . the shuffling and tread of their feet . . . reflected from one hard surface to another . . . build up a mounting din. Sound Conditioning with Acousti-Celotex as shown here in the Junior High School, Mamaroneck, N. Y., subdues this noise and minimizes penetration and disturbance of classrooms off the corridor.**

# QUIET AIDS STUDENT AND TEACHER

***Quiet*** permits the student to apply his full mental energy to the subject at hand. Distracting noises do not delete his attention. He is able, therefore, to accomplish better results in his studies. Quiet enables the student to develop the habit of concentration—so valuable to him throughout his entire life.

***Quiet*** insures correct hearing, by the student, of all classroom procedure. It gives him a better chance to learn.

***Quiet*** is a natural curb to boisterous conduct on the part of students—in corridors at between-class periods—in lunch rooms and cafeterias—in the gymnasium—and other places where confusion is otherwise the rule. He can hear and be heard without effort. Better conduct results from quiet than from excessive regulation.

***Quiet*** aids the instructor because the students hear clearly and are not distracted by class-restlessness, the creaking of seats, the crackling and rustling of many papers, shuffle of feet, and noises from the corridors. As noise destroys the power of teaching, quiet builds it up into an art.

***Quiet*** allows both student and instructor to work a full day's schedule with more energy. Noise causes early fatigue—quiet protects the nervous system from this excessive "wear" and eliminates "afternoon-class-static."

Sound Conditioning is a practical, scientifically proven method of reducing noise and producing the quiet so essential to efficient educational methods.

More schools, colleges and universities have been Sound Conditioned with Acousti-Celotex products than with any other make or type of materials.

There are, perhaps, many things you may want to know about sound conditioning your school buildings. The following two pages are devoted to pertinent information. Study these carefully.

# QUESTIONS and ANSWERS About Sound Conditioning Schools

**1** What is Sound Conditioning?

Sound Conditioning is the art and practice of treating rooms and the interiors of buildings so as to improve hearing conditions and to minimize the annoying effects of noise, . . . "unwanted sound."

**2** What does Sound Conditioning contribute to school administration?

It is one of the greatest agencies for mental hygiene that can be introduced into the school house.

**3** How does the Instructor benefit by Sound Conditioning?

It helps the instructor to present oral instruction more effectively because of better hearing conditions. It is also an aid to better discipline because confusion is reduced.

**4** How does the Student benefit by Sound Conditioning?

It enables the Student to better understand oral instruction and class discussion. He works in an atmosphere that is quiet, not tense; this is conducive to better deportment and easier concentration.

**5** Is Sound Conditioning in Schools something new?

No—over 4500 School Buildings have been sound conditioned with Acousti-Celotex entirely or in part in the last 20 years.

**6** What is Acousti-Celotex?

Acousti-Celotex is the registered trademark identifying sound absorbing perforated fiber tiles, pioneered by The Celotex Corporation and developed into the world's most widely used material in its field.

**7** Is it practical in already erected School Buildings to Sound Condition them progressively as funds can be made available?

Yes, this is often done. At least 50 per cent of Sound Conditioning materials are applied in this way.

**8** What is a recommended progressive program for Sound Conditioning an existing school building?

Start with a noisy corridor, lunch room or band practice room. Auditoriums, gymnasiums, swimming pools, manual training rooms, laboratories, classrooms and administrative offices can follow in whatever order individual circumstances and funds may indicate.

**9** Is Sound Conditioning with Acousti-Celotex expensive?

No, in the average installation Sound Conditioning represents a fraction of 1 per cent of the building cost.

**10** How fast does sound travel in air?

Eleven hundred and twenty feet per second.

**11** In what form does sound travel?

In the form of spherical waves, increasing in size as they leave the source.

**12** In a walled-in enclosure what happens when the sound waves reach the walls?

Part of the sound energy is absorbed and the remainder is reflected back into the room.

**13** Is there a method of testing materials to determine their ability to absorb sound?

Yes, here are the absorption coefficients of some common building materials and furnishings:

| MATERIAL | ABSORBS | REFLECTS |
|---|---|---|
| Plaster | .025 | .975 |
| Concrete | .015 | .985 |
| Wood | .03 | .97 |
| Glass | .027 | .973 |
| Carpet | .20 | .80 |
| Acousti-Celotex Type C-9 | .70 | .30 |

**14** Why do Acoustical Materials absorb so much sound?

All acoustical materials are porous. The sound impulses enter the maze of tiny spaces in the body either through the natural interstices on the surface or through mechanical perforations made in the face of the material expressly for the admission of those sound waves.

In penetrating and traveling through this maze, the sound wave encounters just enough resistance to create friction which transforms the acoustic energy into heat.

Practically, the sound is "soaked up" by the material rather than reflected back into the room.

## 15 How does Sound Conditioning "stop" noise?

Sound Conditioning in itself does not stop noise; a cough, a footstep, a typewriter, a dropped tray, a bookkeeping machine, a ringing telephone bell, or any other noise source generates as much acoustic energy in one location as another.

The loudness is lessened in a sound conditioned room because the original sound dies out faster. It is not amplified by repeated reflections from ceiling to floor and wall to wall as it is in an average room.

Sound is reflected from a hard surface just as light is reflected by a mirror. In the average room with hard plaster walls and ceilings, the sound traveling at an approximate speed of 1120 feet per second, will bounce around the room in all directions many times before the energy it contains is dissipated, or absorbed.

The acoustical material used for sound conditioning absorbs far more of this energy than do ordinary materials, thereby hastening the silencing of the sound.

## 16 How is "Adequate Absorption" determined for a room?

If your car travels 14 miles on one gallon of gasoline and you now have five gallons in the tank, with a journey of 182 miles before you—you can easily calculate that eight gallons more will be required to make the trip.

Likewise, the Sound Conditioning Engineer knows the present absorption capacities of the materials and furnishings in a room, and how far present average noise levels can be profitably lowered by additional absorption. From this he can easily calculate how much additional absorption is required to bring a satisfactory result.

## 17 Is it possible to calculate the length of time sound will remain audible in an auditorium after the source has ceased?

Yes, the period of reverberation can be mathematically determined by means of the Sabine Formula:

$$T = \frac{.05V}{a}$$

T equals reverberation time measured in seconds.
V equals volume of room expressed in cubic feet.
a equals all existing sound absorbing units.

## 18 If the period of reverberation is too long, what are the effects?

If a single sound remains audible too long after it has been stopped at its source, it combines with the following sound, or sounds, from the same source, creating a complex mixture of the several sounds. When this effect is pronounced, the ear cannot distinguish clearly between the individual sounds. For instance, a speaker's words will telescope with those previously spoken making entire phrases "blurred," "fuzzy" and unintelligible.

Music is scrambled in the same way by the "echoes" in an excessively reverberant room. In rehearsals, the conductor or instructor finds difficulty in locating and correcting mistakes.

## 19 Is Reverberation the sole cause of poor acoustics?

In the majority of instances it is. With few exceptions, removal of excessive reverberation will create good hearing conditions.

In occasional cases the shape of a room or unwisely placed curved surfaces which focus sound at specific points will interfere with satisfactory sound distribution.

## 20 Is all Reverberation undesirable?

No. A certain amount is essential if speaking and music are to have a pleasing "live" quality.

## 21 Can Loud Speakers overcome faulty hearing conditions in an auditorium?

As a general rule, no. If reverberation is excessive, speech can not be understood no matter how much it is amplified. The function of loud speakers is to increase the power of the natural voice, when necessary.

## 22 Is there a proper reverberation time for auditoriums of different sizes and capacities, and how is it determined?

Yes. This is known as the Optimum Reverberation time.

Through painstaking experiment and years of experience and observation, the most satisfactory length of time, in seconds, for sounds to die out in auditoriums of various sizes has become known. This is a matter of record and is used as a base in correcting auditorium acoustics.

## 23 Does Acousti-Celotex Sound Conditioning cost more to install in existing school buildings than in new ones?

No, in most installations the cost is the same.

## 24 Does installation of Acousti-Celotex require structural changes in existing buildings?

No, absolutely no structural changes are required.

## 25 Who applies Acousti-Celotex Sound Conditioning?

Only approved distributors who have organizations trained for accurate engineering and expert application. These distributors are selected by The Celotex Corporation and given thorough training in Acoustical engineering and Sound Conditioning practices. See back page on Celotex Sound Conditioning Service.

# Sound Conditioning Schools With Acousti-Celotex Is Not An Experiment

**Hundreds of Schools, Colleges and Universities throughout the nation enjoy Acousti-Celotex sound conditioning. *Read what some of them have to say.***

"I am writing in connection with the acoustical treatment of the Britannia High School auditorium.

"Numerous tests which we have carried out in connection with the improvements in the acoustical qualities of this auditorium have been most gratifying.

"The Vancouver Board of School Trustees and its officials are very satisfied indeed with the most excellent job which you did in connection with the Britannia High School auditorium."

H. N. MacCorkindale,
Superintendent of Schools
Vancouver, B. C.

* * * *

From Charles A. Smith, Kansas City, Architect, "For a number of years I have been using acoustical treatment in the Auditoriums, Music and Expression rooms, Gymnasiums and Swimming Pool rooms of all school buildings, wherever the funds available would allow its use. The beneficial results more than justify the cost.

"I have used Acousti-Celotex treatment in twenty-five school buildings in Kansas City, Missouri, and in many other buildings in the surrounding territory, with uniformly satisfactory results."

* * * *

"The Irvington School has Acousti-Celotex ceilings throughout and the difference in quietness between that building and all other school buildings of the city, is amazing. There is a peace and a relaxed atmosphere which not only simplifies the task of administration, but also improves the disposition and temperament of teachers and pupils. It is one of the greatest agencies for mental hygiene that can be introduced into the school house."

H. M. Barr, Director Research Dept.,
Portland, Oregon, Public Schools

* * * *

"Iowa State College has installed a considerable amount of acoustical treatment in the past few years and among the rooms which have been treated are lecture and classrooms, accounting offices, small radio broadcasting booth, playing room for the carillon, and a dormitory recreation room. Persons who have occasion to use these rooms are apparently very well pleased with the results which have been obtained.

B. H. Platt, Superintendent

"I am writing to congratulate you on the excellent job of sound conditioning the new University High School . . .The contrast between this school and the other schools not so treated is very evident and is remarked upon by all visitors. The noise-subduing effect of the treatment in corridors and halls is most evident and we are highly pleased with the work," *writes* B. F. Pittenger, Dean of the School of Education, The University of Texas at Austin.

* * * *

Brother Anthony, Superior of Morris Institute at Searcy, Arkansas, *comments*, "We derive quite a little amusement from visitors and inspectors by whom we are frequently asked, 'why we do not allow the boys to be as noisy in the gym as in the adjoining playhalls.' Although they saw the boys run and romp as only boys can do with mouths wide open, the visitors felt that restrictions had been imposed until we explained to them the effect of Acousti-Celotex on the ceiling."

* * * *

"One of the most appreciated features of our new Greeley Junior High School building is the Acousti-Celotex sound conditioning. Pupils, teachers, and school patrons are universal in their commendation.

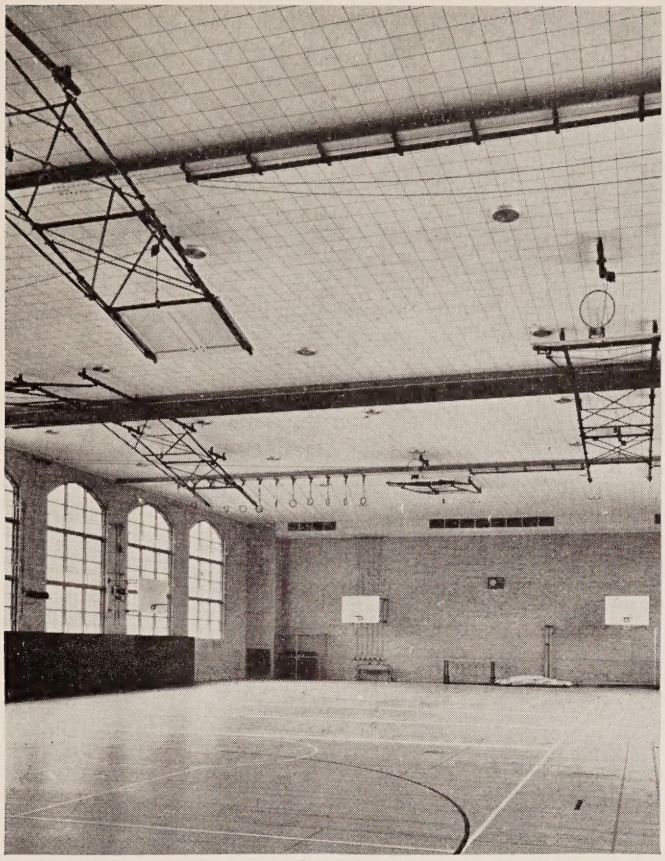
"Having moved our general school offices from the High School building which is not so treated to this building, I can assure you that the difference is very noticeable. Hundreds of students passing in hallways and coming out of classrooms will cause a certain amount of noise. In this building that noise is cut to a minimum. This treatment, plus the large amount of natural lighting which we have, has made our building one of the most modern in this part of the country."

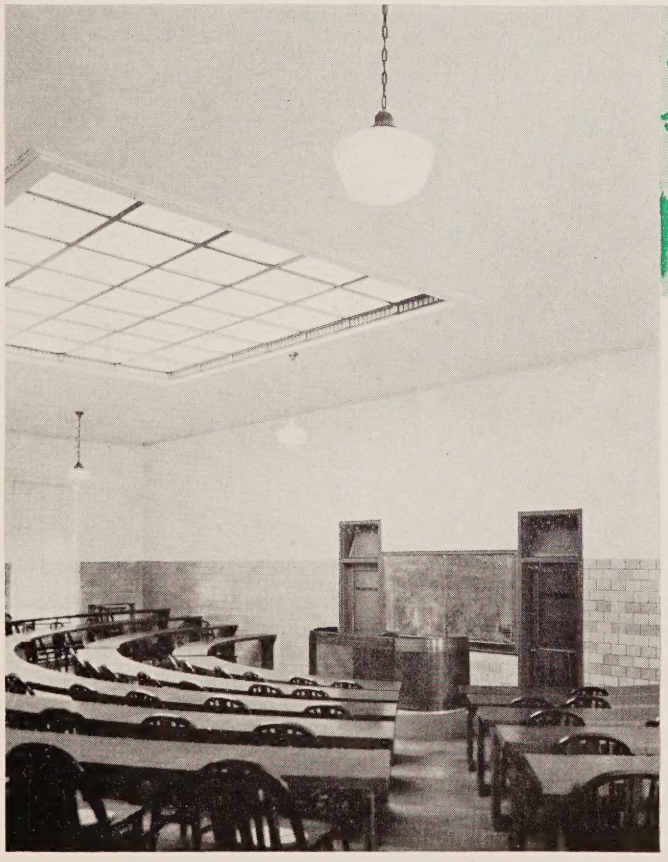
H. D. Eldridge, Superintendent,
City Schools, Greeley, Colorado

* * * *

"Three years ago we placed pre-painted Acousti-Celotex on the ceiling of the Lincoln School auditorium. This treatment changed the room from a 'rainbarrel' to an auditorium with perfect acoustics. Two years ago we treated the ceilings of all corridors, music rooms, and office quarters in the Lincoln Building. Our new $300,000 addition has complete Acousti-Celotex Sound Conditioning. The latter includes all classrooms, corridors, gymnasium-auditorium, music rooms, etc. The band room is perfect. It confines all sound. In general, may I say that it prevents teachers' and pupils' nerves from getting on edge. It is conducive to quiet concentration."

Reede Gray, Superintendent,
The Public Schools,
Redwood Falls, Minnesota





## Quiet for Study and Play

**Certainly a gymnasium is no place in which to curb the noise of athletic youth—yet without sound conditioning noise becomes a problem not only for the gym instructor but for instructors and students in *adjoining* classrooms as well. Illustrated is the gymnasium of Eastern High School, Baltimore, sound conditioned with Acousti-Celotex. No better way to lure young people into a library than to provide and insure quiet, without imposing strict rules. Preston M. Geren did just this by using decorated Acousti-Celotex on the ceiling in the New London High School Library, New London, Texas . . . Architects Weiss, Dreyfous & Feiferth, used Acousti-Celotex Sound Conditioning to make lecturing and the taking of notes a simple, easy pleasure in the Leche Hall Lecture Room, Louisiana State Univ.**

# SELECTING THE PROPER MATERIALS

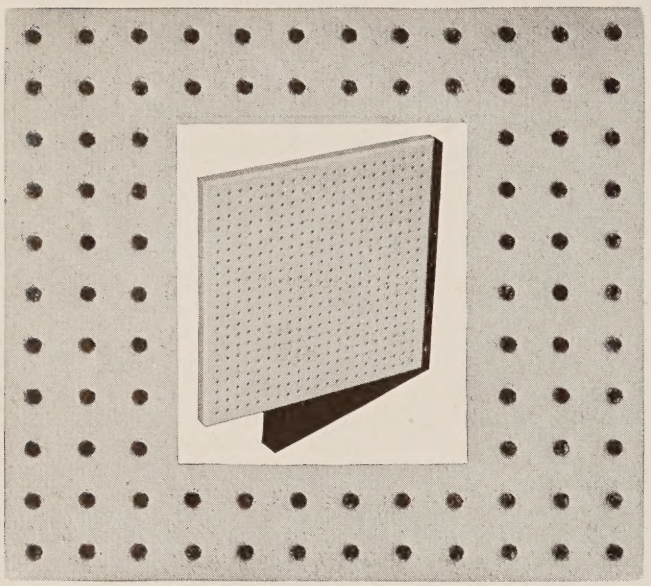
The sound conditioning of building interiors usually requires the introduction of sound-absorbing materials for comfortable and efficient use. Products designed specifically for this purpose are commonly known as *acoustical products.*

Celotex acoustical products include Acousti-Celotex cane and mineral tiles (top two pictures) and Muffletone standard and fissured tiles (two lower pictures). Both are made in different thicknesses, thus providing a range of sound absorption from which proper selection can be made in each case.

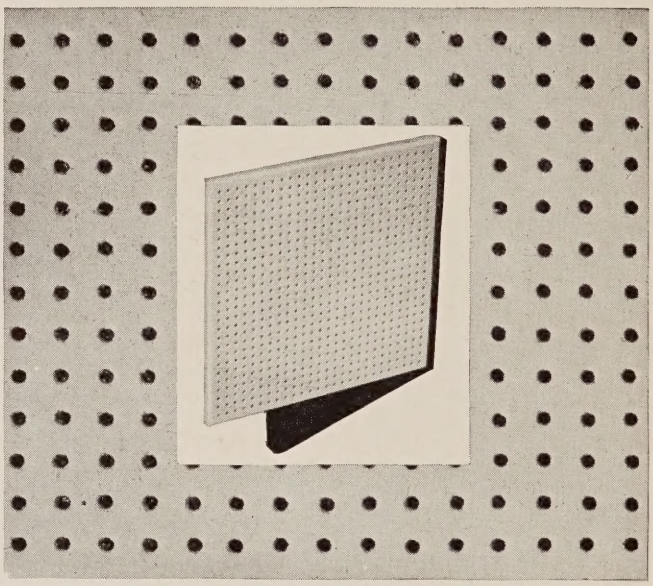
Each area to be sound conditioned must be accurately analyzed and engineered so that the right material may be specified to produce the results desired.

Which material to use, how and where to install it for best results, the mechanics of efficient, economical erection—these important questions may be safely left in the hands of the local Celotex Sound Conditioning distributor. Part of the world's most widely experienced organization in this field, he can be depended upon for competent, efficient service.

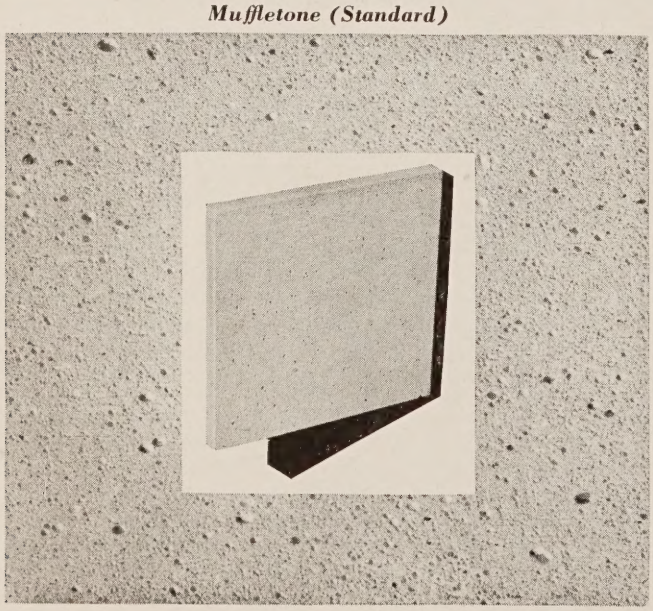
*Acousti-Celotex (Cane)*



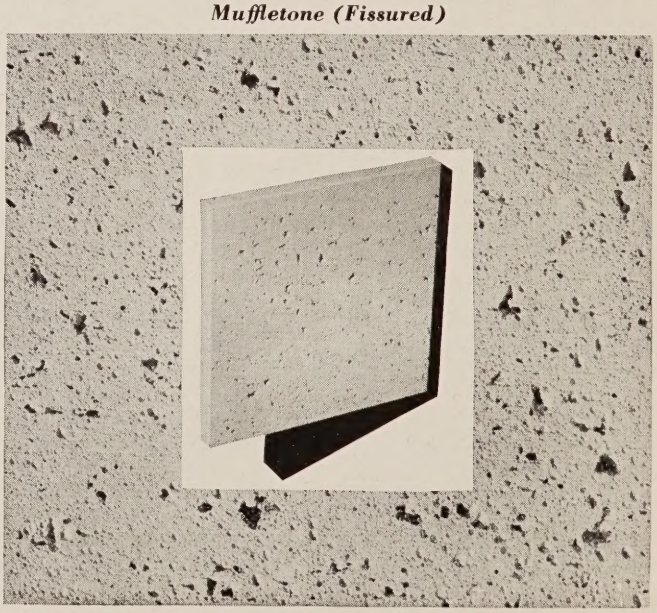
*Acousti-Celotex (Mineral)*

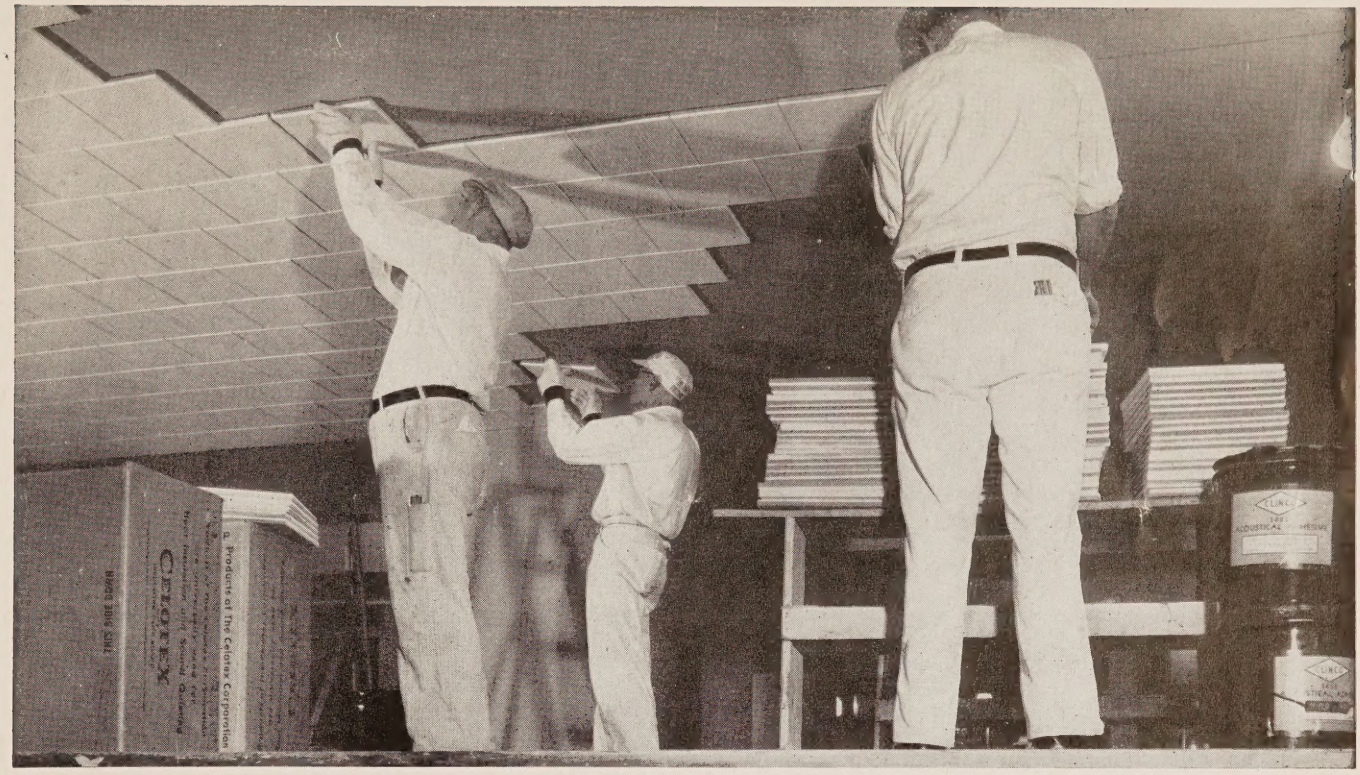


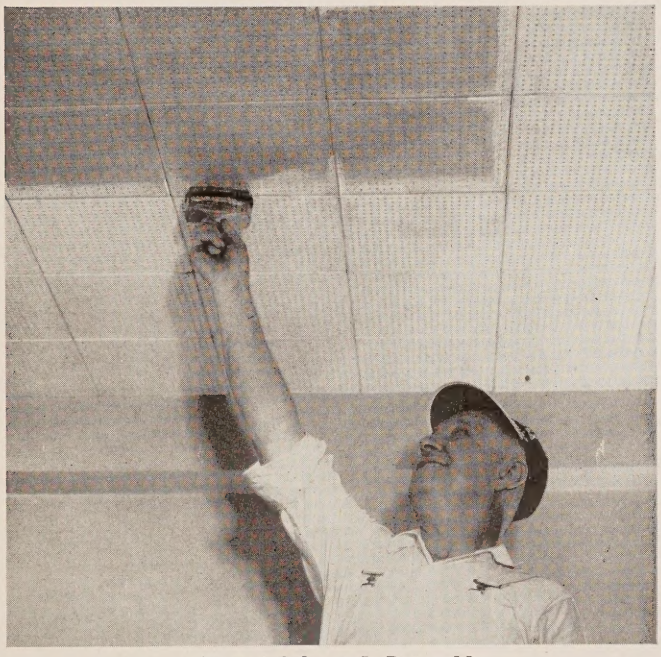
*Muffletone (Standard)*



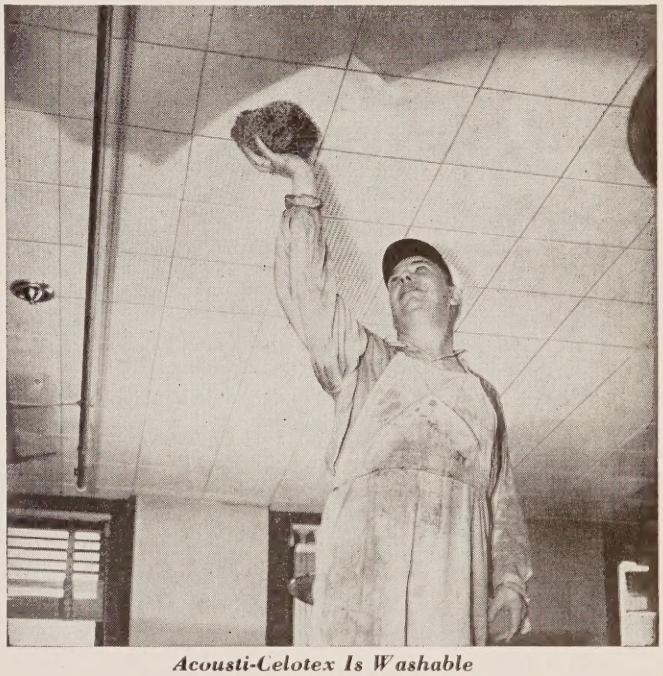
*Muffletone (Fissured)*





*Acousti-Celotex Is Paintable*



*Acousti-Celotex Is Washable*

# YOU CAN SOUND CONDITION OVERNIGHT!

The process of transforming a noisy room into a quiet one with Celotex Sound Conditioning is not an ordeal. In occupied quarters, the work can be done overnight by skilled, trained mechanics.

"Thank your representatives . . . we appreciate very genuinely the prompt and courteous manner in which your workmen functioned"—this kindly expression is typical of many addressed to Celotex Sound Conditioning distributors. Service to them is a solid asset, painstakingly built up over many years' experience in this field.

**No Extra Maintenance Costs with Acousti-Celotex**—Areas sound conditioned with Acousti-Celotex demand only the care and treatment of ordinary wall and ceiling surfaces. Nothing extra is required. Painting may be done without damage to the sound absorption of the materials.

## Celotex Sound Conditioning Service

Useful knowledge in science grows with practical experience. Such experience in the field of architectural acoustics consists in the number and variety of problems dealt with. To develop this experience rapidly, The Celotex Corporation in 1925 chose to seek out, school, and establish in all principal market centers an authorized engineering, sales, and contract service by independent, locally owned and operated enterprises.

The combination of this merchandising policy with Celotex Acoustical Products rapidly won and has steadily maintained a position of leadership in this industry.

This policy, controlled through territory franchises, has been the means of providing architect and owner dependable engineering and application service. With profits coming only from material sales, The Celotex Corporation has the same interest as architect and owner in seeing fair job prices established and maintained.

The Celotex Corporation is proud of the service ideals which its acoustical distributor organization, no less than its own personnel, have woven into the fabric of this business. Ability in diagnosing acoustical problems, honesty in surveys and recommendations, considerateness as well as promptness in contract application work, and timeless interest in the satisfactory performance of every job—these are what we mean by service ideals.

They constitute plus values written into every specification for a Celotex Acoustical Product.

**THE CELOTEX CORPORATION • CHICAGO**

### Sound Conditioning Is Our Business

**For years, in this area, we have been exclusive distributors of Acousti-Celotex Products. We have analyzed, engineered and installed Sound Conditioning in schools, offices, factories, banks, public buildings, stores, churches, hospitals, restaurants, theatres and other buildings.**

**We are a part of the world's most experienced sound conditioning organization.**

**Complete information is yours without obligation. Just write or call . . .**

*Sound Conditioning with*

**ACOUSTI-CELOTEX**

REG. U.S. PAT. OFF.

*Perforated Fibre Tile* SINCE 1923

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